

The present invention relates to multi-fold window and/or door assemblies.

The present invention is directed to a multi-fold arrangement adapted to lend itself to a more expansive opening configuration compared to alternative arrangements. Typical bifold assemblies as disclosed in our New Zealand patent specification no. 336696, are capable of being folded or opened back to the edge of the window or door opening. In such instances the folded windows or door panels create an obstruction of sorts be it visual or otherwise. Such prior art arrangements do not allow the entire wall opening to be fully utilised as they are constrained by hinges built into tracking arrangements.

The present invention is therefore directed to an arrangement, for at least a bifold panel (glazed or otherwise) structure, and whether for door or window purposes or a hybrid of both, whether top or bottom mounted (supported), which alone or in conjunction with a mirrored arrangement can provide an alternative to existing multifold panel systems. It is an object of the present invention to more fully exploit the space provided for by a wall opening for which a multifold window and/or door assembly is intended.

In a first aspect the present invention consists in **a closure assembly of an opening of or in a building or like structure**, said closure assembly having two mutually pivoted panels (glazed or otherwise) mounted so as to be disposable in three types of condition:

- (i) a closed condition whereby said two panels provide at least a partial closure of said opening,
- (ii) a second condition (which preferably includes a range of panel to panel angular dispositions) where both distal extremities of the mutually pivoted panels are constrained to pivot from either
 - (A) an axis fixed with respect to said opening and an axis tracked with respect to said opening, or
 - (B) two spaced axes (each tracked relative to said opening), and
- (iii) a third condition (which preferably includes a range of panel to panel angular dispositions) where the mutually pivoted panels are constrained to pivot from only
 - (A) an axis fixed with respect to said opening, or
 - (B) an axis tracked with respect to said opening, such third condition including the prospect of said panels folding to each other about their mutual pivot and being positioned in that condition away from said opening.

In yet another aspect the present invention consists in **a bifold door or window structure where the or tracked distal pivot is disengageable from its tracking thereby**

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allowing the said bifold door or window structure

(i) to be opened if still having its distal pivot tracked as a conventional (or the like) bifold door or window and

(ii) if with its distal pivot disengaged from such track, to be opened clear of the track with the distal panel of said bifold door panel from which it is pivoted.

In a another aspect the present invention consists in a **multifold window and/or door assembly** of a kind having two or more window and/or door panels (glazed or otherwise) hinged together about a vertical axis and adapted, in a closed condition to lie in the plane (hereafter "said plane") of a wall opening (at least in part) closeable thereby,

wherein a first said window or door panel which is, at least in said closed condition, proximate a vertical periphery of said wall opening and is pivot supported by means providing a vertical pivot axes (hereafter "said first pivot axes") disposed to that side of said plane to which that first panel is to open from said closed condition,

and a second said window and/or door panel connected to said first panel by means providing a vertical pivot axes (hereinafter "said first/second panel pivot axes") which in said closed condition is disposed to that side of said plane opposite to that to which said first panel is to open thereby to facilitate, in the first open condition, the pivoting of said second panel towards said first panel when both said panels are angled to said plane and said first/second panel pivot axes is further away from said plane than it is in said closed condition,

and wherein said second panel is tracked and pivoted by tracking means at its distal vertical extremity (or thereabouts) by means that provides for the tracked pivoting of said second panel out of said plane about a vertical pivot axes (hereinafter said "distal pivot"),

and wherein said second panel is capable of being disengaged, either manually or otherwise, from said tracking means thereby facilitating a second open condition, said second open condition characterised in that both said panels, irrespective of their orientation to one another, are capable of being rotated away from said plane about said first pivot axes.

In still a further aspect the present invention consists in a **method of disengaging a multi fold door or window in part from its tracking** which involves the disengagement of a pivot axis providing means in whole or in part from said tracking or a bogie confined to said tracking.

Preferably pivot axis is defined by a vertical load carrying pivot.

In still a further aspect the present invention consists in a **structure or assembly** closed or opened by an assembly in accordance with the present invention or using a method

more of the accompanying drawings.

To those skilled in the art to which the invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the scope of the invention as defined in the appended claims. The disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting.

Preferred forms of the present invention will now be described with reference to the accompanying drawings in which;

Figure 1 is a plan view of a two panel bifold arrangement, the glazing panels being substantially compacted to enable greater visibility, and there being three distinct vertical axes shown from left to right,

Figure 2A shows the arrangement of **Figure 1** in its first open condition, both panels being inclined to the plane defining the wall opening, and the distal pivot axis remaining in its tracking plane,

Figure 2B shows a similar plan view to that shown in **figure 2A** however in this case emphasising the obstruction that arises upon opening a typical bifold panel arrangement that does not accord with the present invention,

Figure 3 is once again a plan view of the arrangement shown in **Figures 1 and 2**, in this instance the pins providing the distal pivot axis have been disengaged from the bogies, thereby allowing the first and second panels to be subsequently opened to a second open condition about the first panel pivot axis,

Figure 4A is a side view of panel assembly of **Figure 1** showing the top and bottom door or window frames in combination with preferred bogie assemblies which accord with the present invention, the bogies providing rebates or hollows for engaging pins which are shown in their engaged configuration,

Figure 4B shows a similar view to **Figure 4A** but one where the pins have been retracted allowing the second panel to be disengaged from the bogie thus facilitating the second open condition shown in plane in **Figure 3**,

Figure 5 is a side view of one type of linkage that might be used to retract or deploy the pivot providing pins, there being a screw type rotational member or the like that may be turned using a hexagonal key thus imparting either an upward or downward motion to the pivot providing pin which is suitably shaped to engage the bogies as shown in **Figure 4A and 4B**,

Figure 6A is a plan view of in a simplified form showing relative to a door or window

frame two stile members, one being pivoted from the door or window frame by a hinge (not shown) but generally indicated by the letter "H" and the other being tracked by a bogie (not shown), the stile having the tracked bogie being of a different configuration to that previously depicted,

Figure 6B is a partial view of the arrangement of Figure 6A (ie; one part of the frame only being shown in this plane view) but showing the cam rotatable pin received and locked into a receiving member positioned in the stile, which has the tracked bogie (preferably at the time of release of that stile from the tracked bogie),

Figure 7 is an elevational view of the two stiles in the condition shown in Figure 6A, a said pin capable of being rotated under the action of a cam from its condition shown in Figure 6A to the condition shown in Figure 6B,

Figure 8 is a view "X-X" of the retention member for the pin disposed within the bogie tracked stile, Figure 8 showing the general preferred keyhole form thereof such that there is an easy opening for the pin to be inserted through and thereafter preferably downward sliding of such member can achieve an appropriate lock on the pin,

Figure 9 is a similar view to that of Figure 7 but in the relevant condition of the stiles as shown in Figure 6, but with the pin simply having been inserted into the larger opening of the keyhole form of Figure 8,

Figure 10 is a similar view to that of Figure 9 but showing the effect, on locking the pin of Figure 9, the downward movement of the form as shown in Figure 8 will have,

Figure 11 is an isometric view of an assembly of the kind shown in Figure 5 but from the direction AA with respect to the assembly of Figure 6A, the exploded isometric view of Figure 11 showing the means for rotation to both raise and lower top and bottom engaging members and at the same time raise a key hole type member, and

Figure 12 is a partial view of the arrangement of Figure 11 but in the direction BB.

In the preferred form of the present invention the bifold panel assembly 1 comprises a first panel 2 and a second panel 3, such an arrangement being perhaps mirrored or perhaps utilised as a two panel assembly as shown in the accompanying drawings. In each case the bifold panel arrangement is characterised by a first pivot axis 4, a second pivot axis 5, and a third distal pivot axes 6, all axes being substantially vertical or parallel to the plane defining the wall opening. In the preferred form of the present invention both first and second panels possess glazing panels 7 which have been substantially compacted to allow greater visibility.

The present invention can have the following panel dispositions:

2.2.0 (ie; as shown 2 panel door, 2 panels one way and 0 panels the other way (e.g.

opening to the left)),

2 0.2;

3.2.1;

3.1.2;

4.2.2; etc.

The bifold panel assembly of Figure 2A and 2B shows one of many possible first open configurations, both panels 2 and 3 being inclined to a plane defining the wall opening, the arrangement shown being that of a typical bifold panel assembly in an open condition representing the limiting extent to which the arrangement may be opened. As shown in Figure 2B the out folded panel assembly provides a potential obstruction. It is at this stage the present invention departs from this limiting extent in that the pivot axis providing pins 10 may be retracted at the distal pivot 6 so as to disengage the bogies 9 (positioned top and bottom) from the second panel.

The means for retracting the pivot providing pins from the top and bottom bogies is preferably such that both top and bottom pins may be retracted manually or otherwise by a single operation. However the present invention also envisages variants where both pivot providing pins might be engaged or disengaged from the bogies independently. Preferably the retraction of the pivot providing pins is achieved via a mechanical linkage or the like (e.g. such as that shown in Figure 5) contained within the panel 3 or window panel cavity 11.

Once the pivot providing pins 10 have been retracted as shown in Figure 4B both panels 2 and 3 may be opened out to a further extent as shown in Figure 3.

Figure 5 shows a mechanical linkage of the type that might be used to retract or deploy the pivot providing pins 10. The linkage 12 comprises a rotational screw type member 13 that may be turned manually or with the use of a key (e.g. a hexagonal allen key or similar). In such an arrangement the rotation of the member 13 imparts a substantially upward or downward movement of the pivot providing pin 10. In this particular case this is achieved via a connecting rod which is connected to the pivot providing pin 10 and arms 15 which protrude from the member 13. Although not shown the present invention envisages a variety of linkages and mechanisms that maybe used to retract or deploy such pins.

The panels provide for a variety of different loadings. Bogie 9B preferably carries the vertical gravitational loads of the panel and transmuts these loads into the sill. It is the disengagement from a loaded body that subsequently becomes important from a loading point of view. Bogie 9A carries side loads as a result of the door being opened. There is the prospect therefore that bogie 9A could instead simply be a roller running in a track in order to

accommodate such side loads.

One of the key advantages of the retractable pivot providing pins shown in the accompanying drawings is that the obstructed region 8 shown in Figure 2B may be reduced, if not entirely avoided all together. It is thought that such a system offers a significant advantage over prior art type multifold panel arrangements which have the limitation of being folded back simply to the periphery of the wall opening. The physical obstruction outstanding in Figure 2B will no longer be present, ie; with the present invention the opened panels don't need to project out onto a deck.

As previously described Figure 6A through Figure 12 show how means can be provided whereby stiles 11A tracked by pivot axis 17 between the door or window frame members 18 can be associated or disassociated with the stile 16 hinged to one of the members 18 by a hinge (not shown) but generally depicted as being at or about the region bearing the "H".

As can be seen there is provided within the stile 11A a member 19 into which a pin 20 is engageable upon its rotation from its condition as shown in Figure 6A and Figure 7 to the condition thereof shown in Figure 6B and Figure 9. A downward movement of the member 19 as depicted by the arrow in Figure 10 will have the effect of locking the keyhole form onto the end of the pin 20.

The pin 20 is pivoted at 22 in conjunction with a cam arrangement 23 which allows operator rotation thereof.

The vertical reversible movements of the member 19 is under the action of the rotatable member 13 shown in Figure 11 which can simultaneously have the effect of engaging or disengaging the pivot providing pin or the like of the stile 11A from its associated tracked bogie.

The arrangement of Figure 6A through 12 has the effect of enabling an optional association of two panels of a bifold or multifold together prior to their being allowed to swing free of the tracking.

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WHAT WE CLAIM IS:

1. **A closure assembly of an opening of or in a building, said closure assembly having two mutually pivoted panels (glazed or otherwise) mounted so as to be disposable in three types of condition:**

(i) **a closed condition whereby said two panels provide at least a partial closure of said opening,**

(ii) **a second condition where both distal extremities of the mutually pivoted panels are constrained to pivot from either**

(A) an axis fixed with respect to said opening and an axis tracked with respect to said opening, or

(B) two spaced axes (each tracked relative to said opening), and

(iii) **a third condition where the mutually pivoted panels are constrained to pivot from only**

(A) said axis fixed with respect to said opening, or

(B) an axis tracked (being one of said two spaced axes) with respect to said opening,

such third condition including the prospect of said panels folding to each other about their mutual pivot and being positioned in that condition away from said opening,

wherein by means of a disengagement a previously tracked axis of a said panel can be released with respect to the track to allow said panels to pivot away from said opening.

2. **An assembly of claim 1 wherein condition (A) includes a range of panel to panel angular dispositions.**

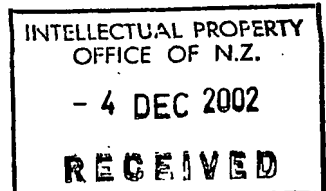
3. **An assembly of claim 1 or 2 wherein condition (B) includes a range of panel to panel angular dispositions.**

4. **A bifold door or window structure where the or a tracked distal pivot is disengageable from its tracking thereby allowing the said bifold door or window structure**

(i) to be opened if still having its distal pivot tracked as a conventional bifold door or window and

(ii) if with its distal pivot disengaged from such track, to be opened clear of the track with the distal panel of said bifold door panel from which it is pivoted.

5. **A structure of claim 4 wherein the bifold door or window has one tracked distal pivot only, the other distal pivot being associated with a door or window frame.**



6. **A multifold window and/or door assembly of a kind having two or more window and/or door panels (glazed or otherwise) hinged together about a vertical axis and adapted, in a closed condition to lie in the plane (hereafter "said plane") of a wall opening (at least in part) closeable thereby,**

wherein a first said window or door panel which is, at least in said closed condition, proximate a vertical periphery of said wall opening and is pivot supported by means providing a vertical pivot axes (hereafter "said first pivot axes") disposed to that side of said plane to which that first panel is to open from said closed condition,

and a second said window and/or door panel connected to said first panel by means providing a vertical pivot axes (hereinafter "said first/second panel pivot axes") which in said closed condition is disposed to that side of said plane opposite to that to which said first panel is to open thereby to facilitate, in the first open condition, the pivoting of said second panel towards said first panel when both said panels are angled to said plane and said first/second panel pivot axes is further away from said plane than it is in said closed condition,

and wherein said second panel is tracked and pivoted by tracking means at its distal vertical extremity (or thereabouts) by means that provides for the tracked pivoting of said second panel out of said plane about a vertical pivot axes (hereinafter said "distal pivot"),

and wherein said second panel is capable of being disengaged, either manually or otherwise, from said tracking means thereby facilitating a second open condition, said second open condition characterised in that both said panels, irrespective of their orientation to one another, are capable of being rotated away from said plane about said first pivot axes.

7. **A method of disengaging a multi fold door or window in part from its tracking which involves the disengagement of a pivot axis providing means in whole or in part from said tracking or a bogie confined to said tracking as claimed in any one of claims 1 to 6.**

8. **A structure or assembly closed or opened by an assembly in accordance with claim 6 or using a method in accordance with claim 7.**

9. **A pivot providing unit having a pin for releasable engagement with a bogie thereof.**

10. **A unit of claim 9 wherein said bogie is trackable.**

11. **A method of expanding the opening configuration of a multi fold door or window assembly which involves the use of a disengageable pivot axis providing unit as claimed in claim 9 or 10.**

12. **A multifold door or window having the modes of closed and opened conditions substantially as herein described with reference to any one or more of the accompanying**

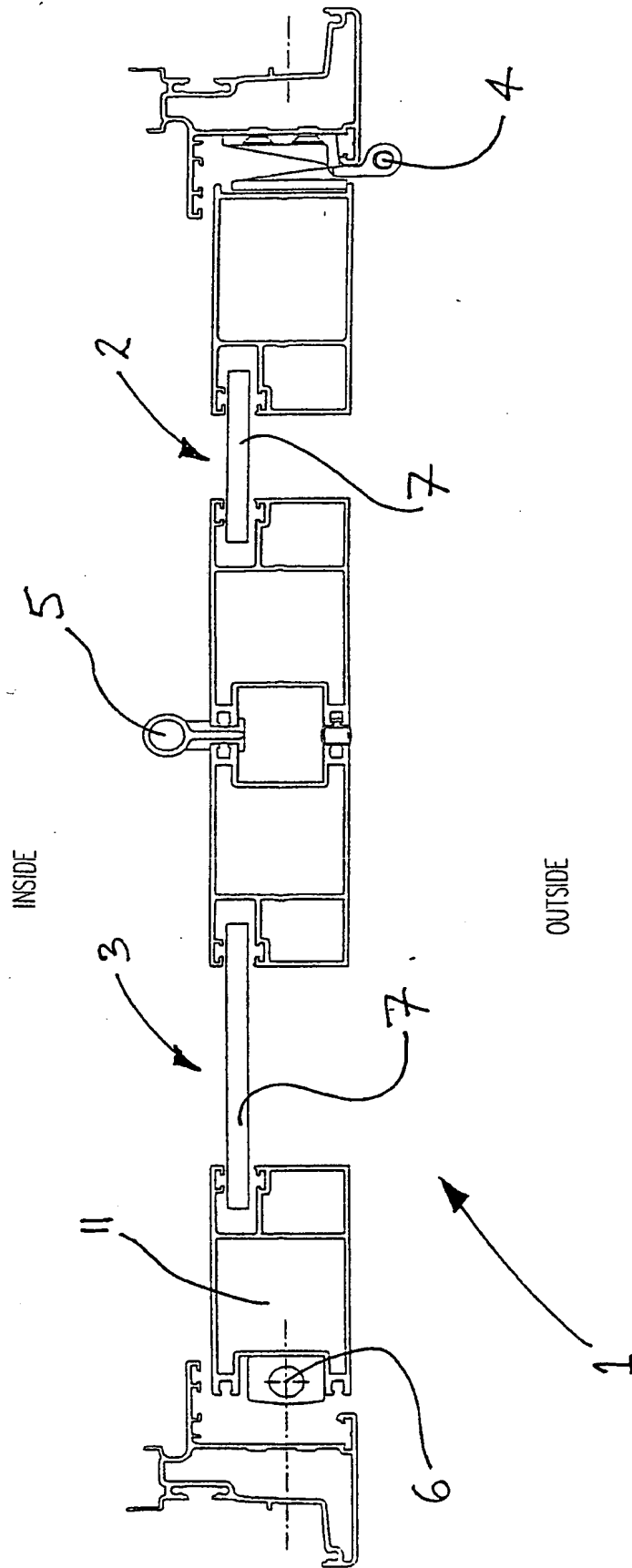


FIGURE 1

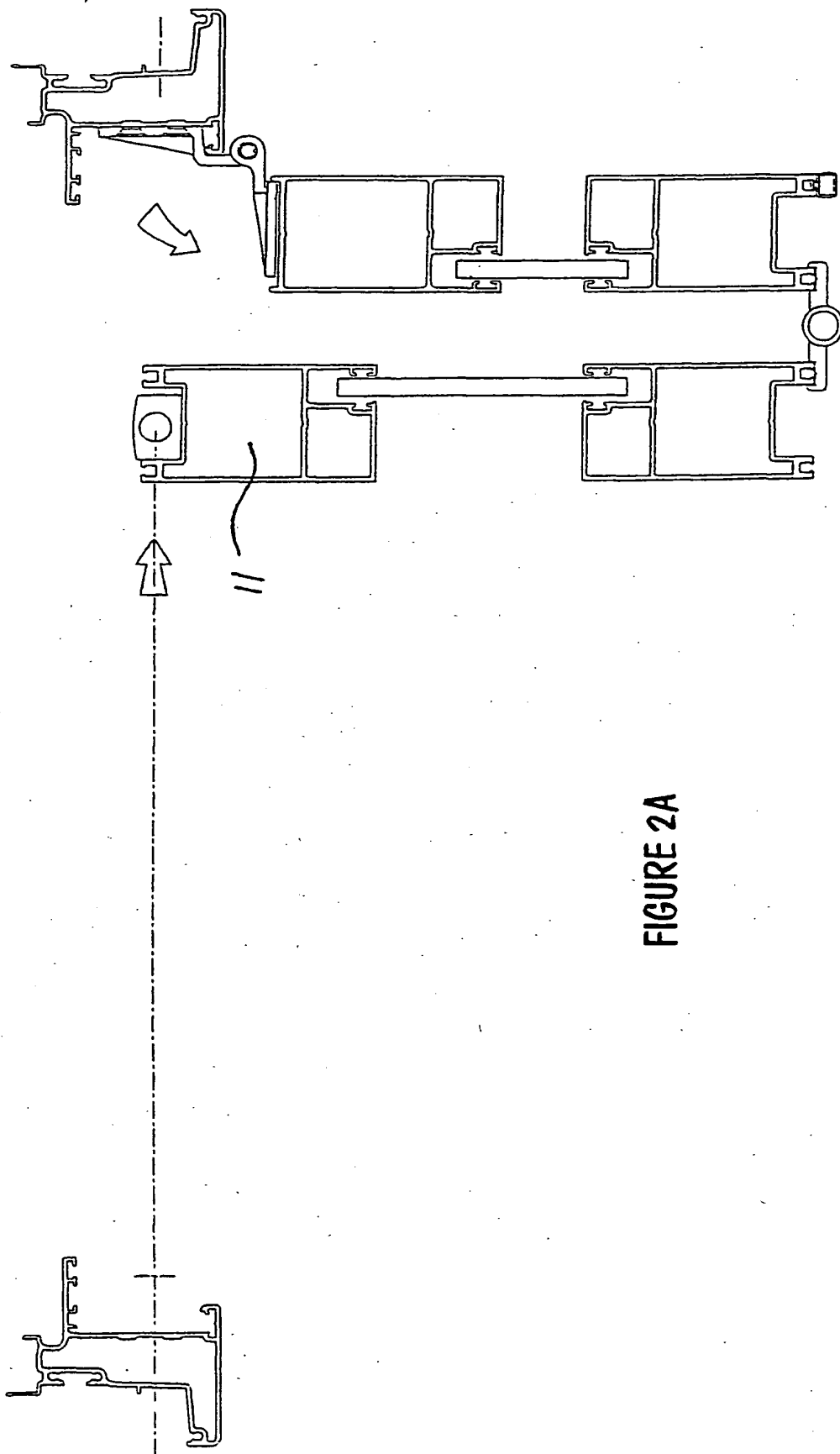


FIGURE 2A

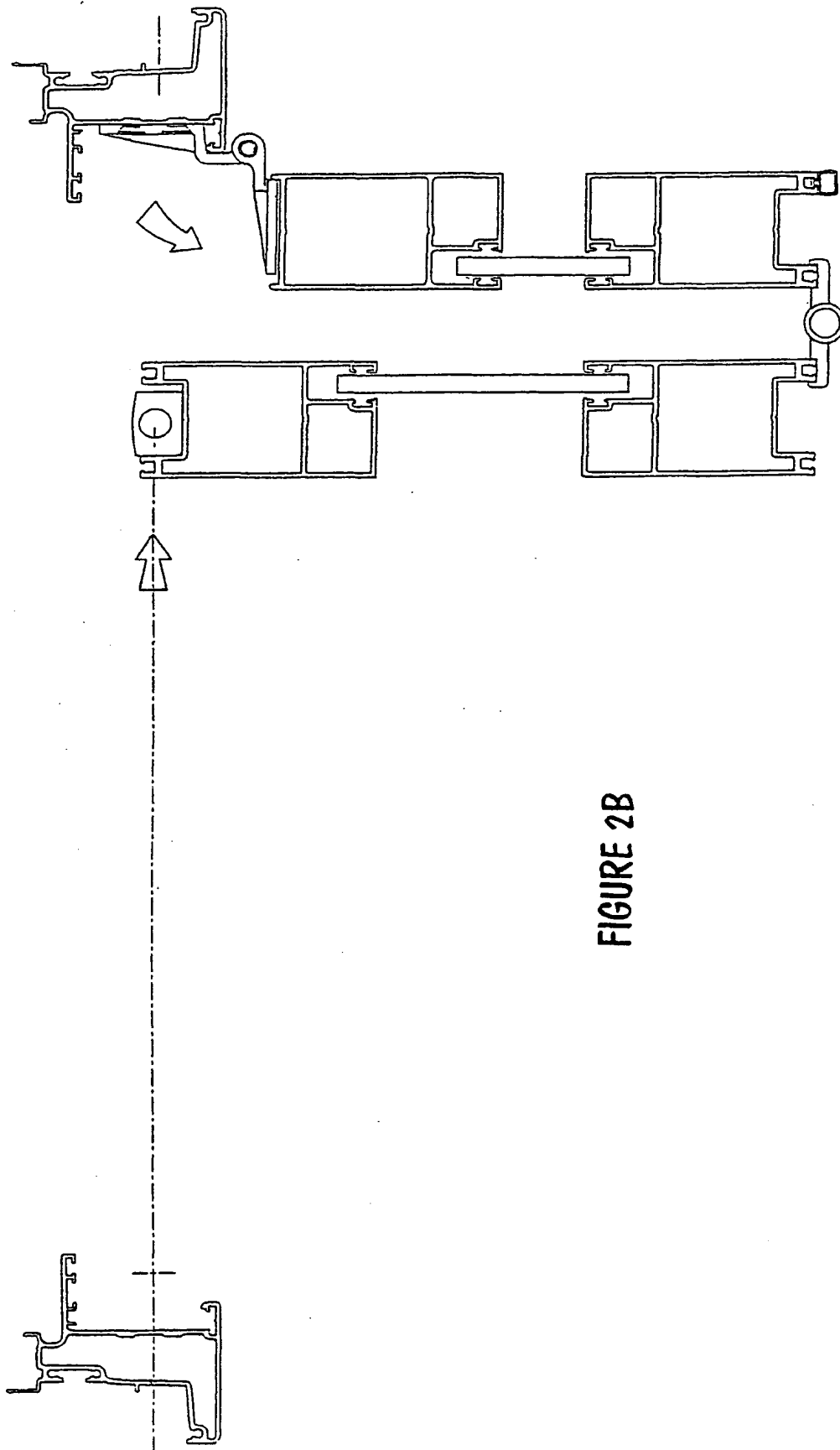


FIGURE 2B

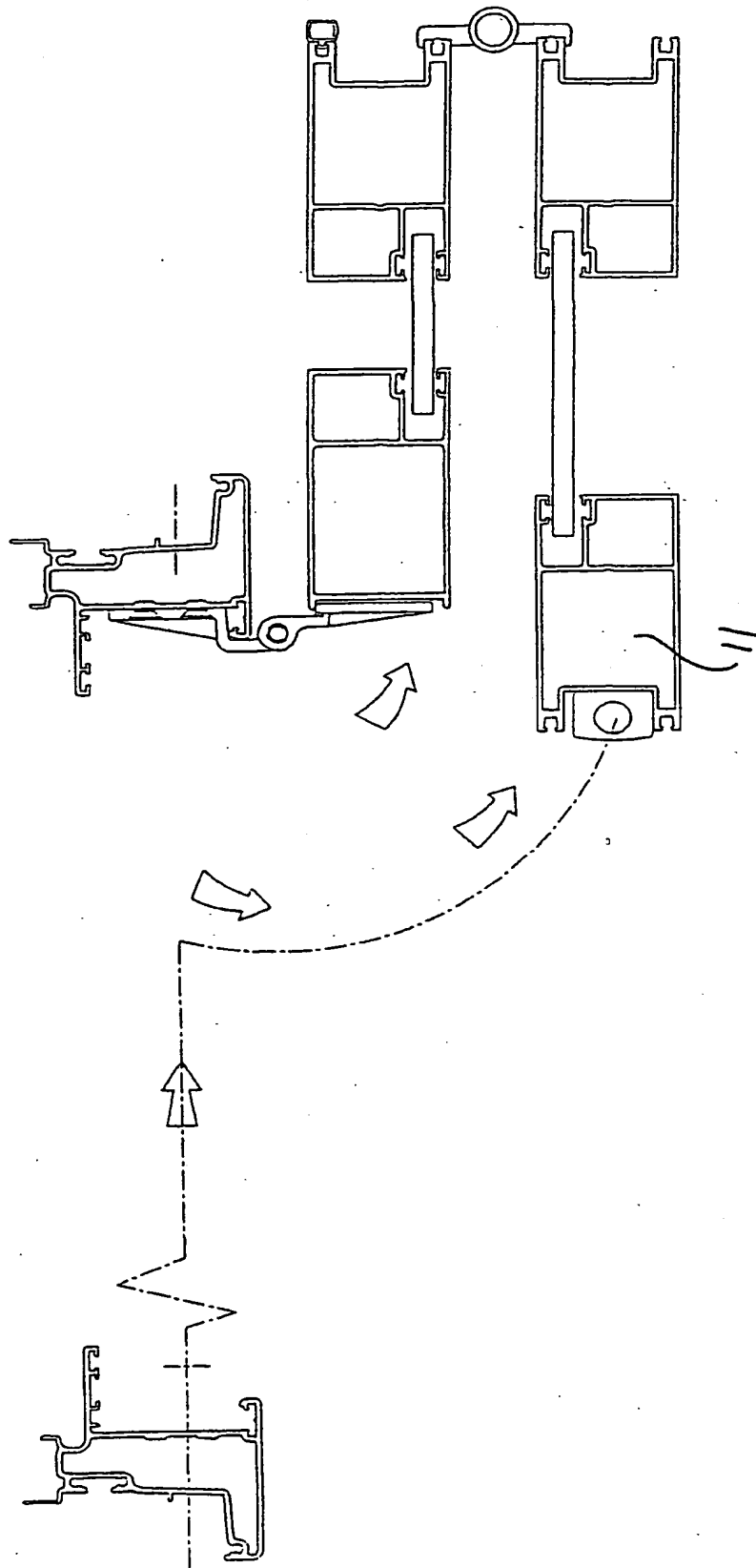


FIGURE 3

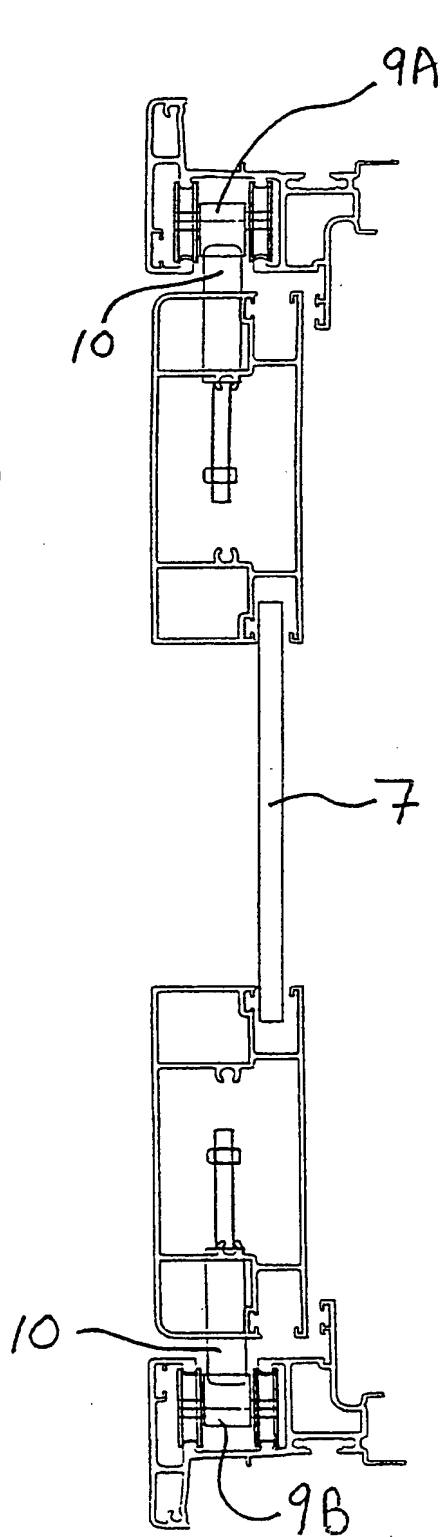


FIGURE 4A

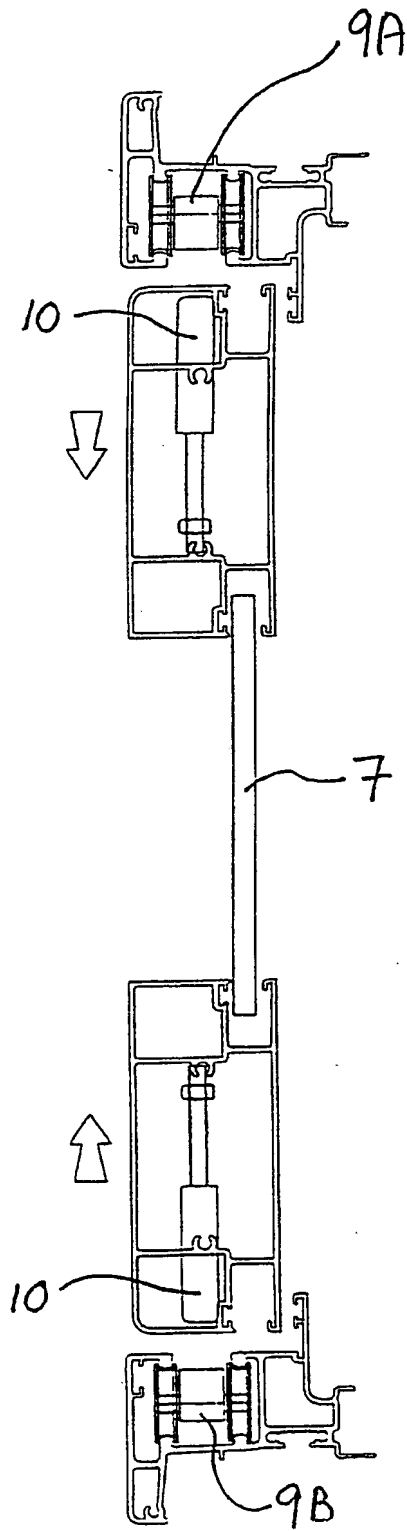


FIGURE 4B

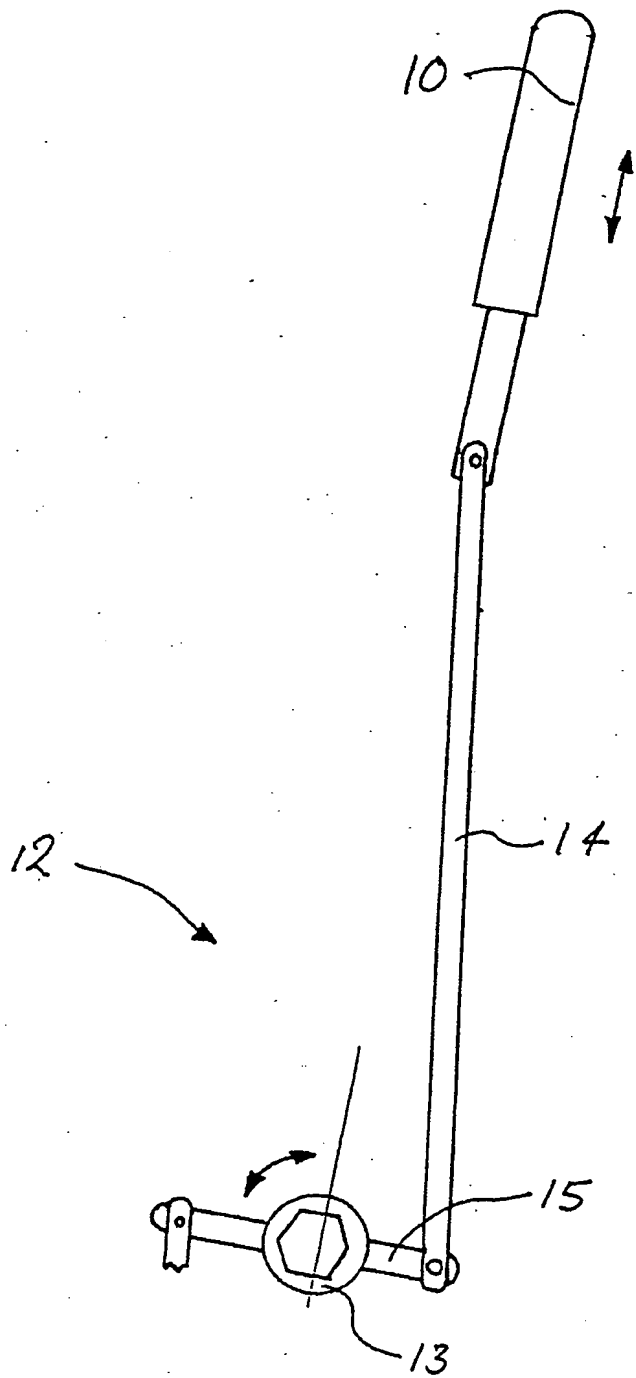


FIGURE 5

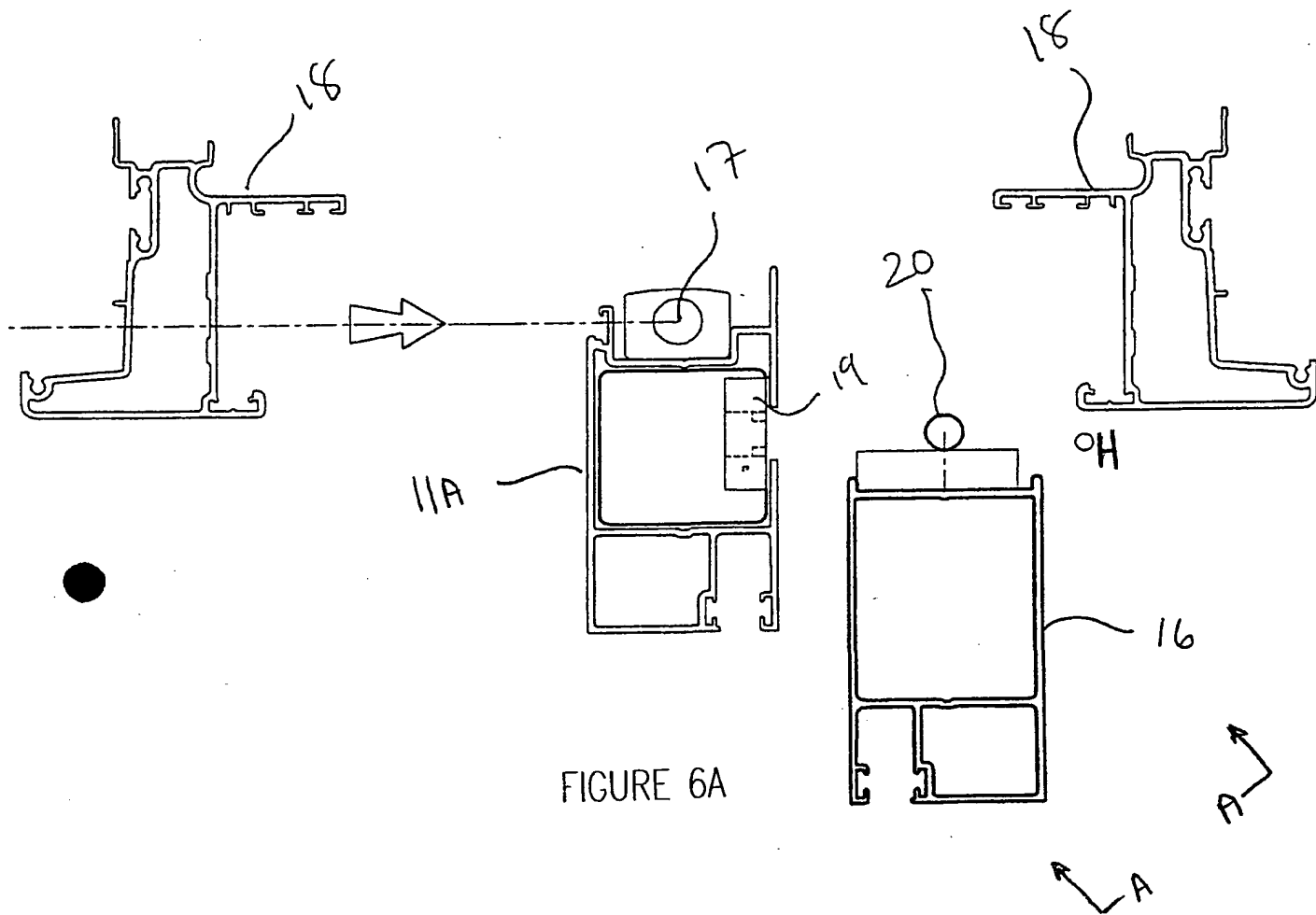


FIGURE 6A

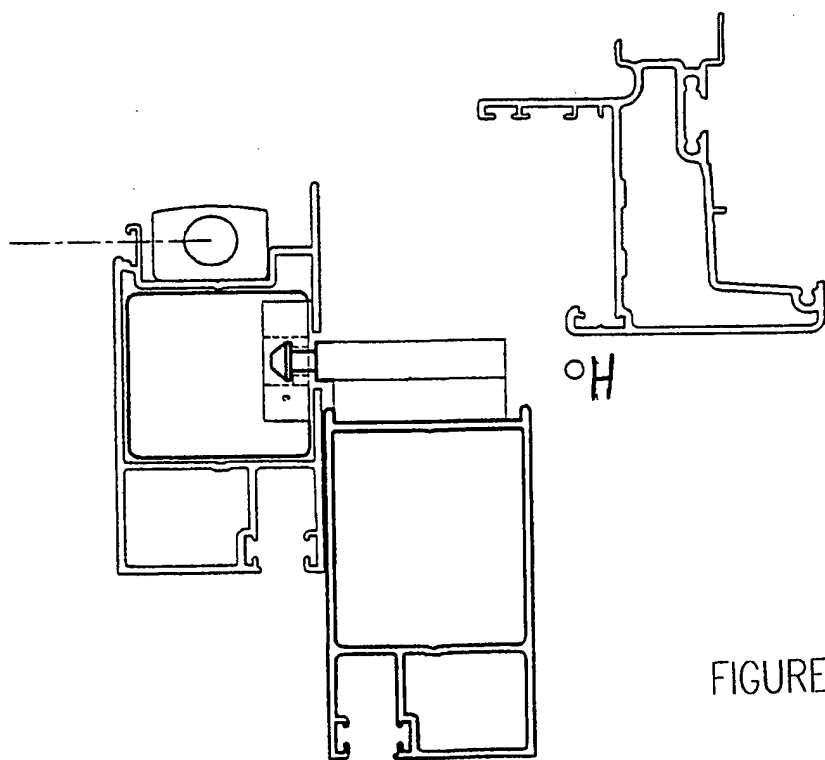


FIGURE 6B

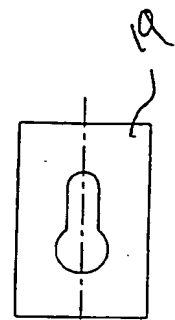


FIGURE 8

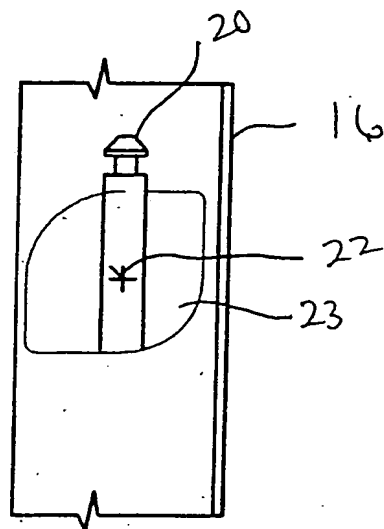
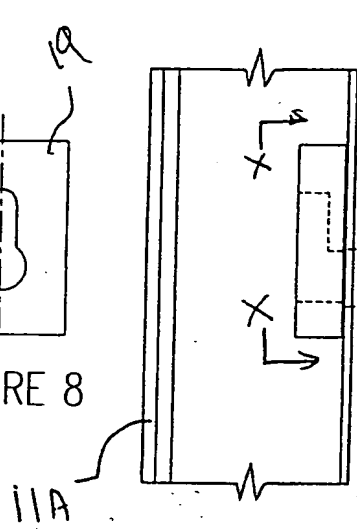


FIGURE 7

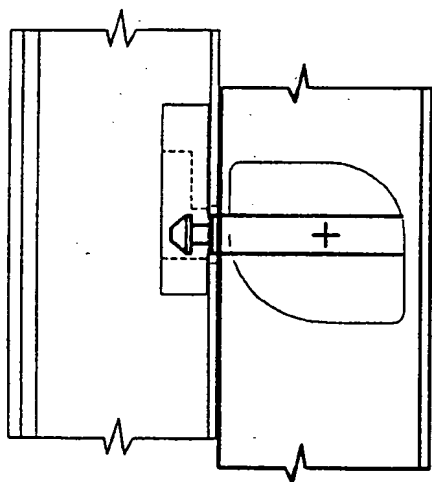


FIGURE 9

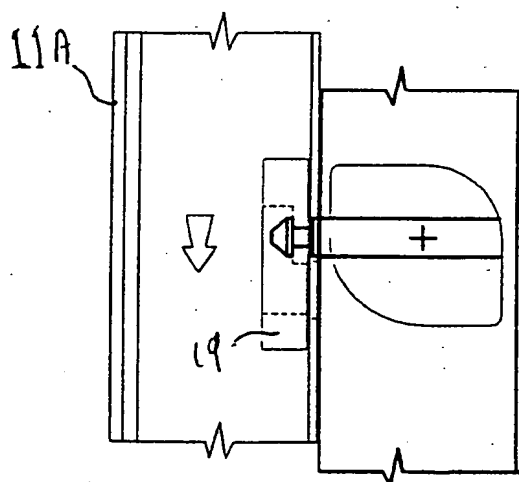


FIGURE 10

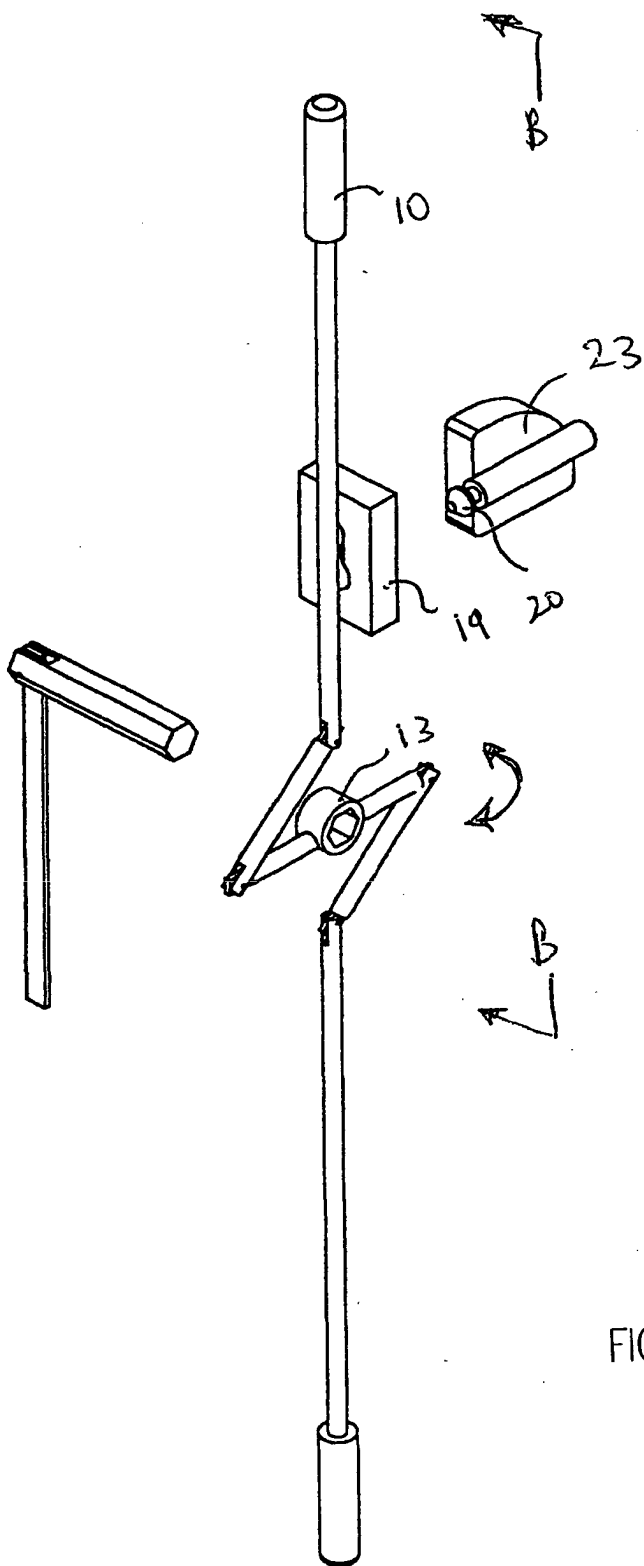


FIGURE 11

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